

Glenn-Colusa Irrigation District

SBX7-7 Water Measurement Compliance Program

Table of Contents

Purpose	1
Program Components.....	2
Proposed Physical Measurement Alternatives and Criteria.....	2
Proposed Measurement Protocols, Customer Billing, and Reporting	5
A. Measurement Protocol.....	5
B. Customer Billing.....	6
C. Reporting	6
Proposition 218 Compliance to Address New Infrastructure Costs and New Rate Methodologies Incorporating In-Part Volumetric Pricing	6
Exhibit 1: Proposed Pilot Project	
Exhibit 2: Implementation Timeline	
Exhibit 3: Non-exclusive Meter Options	
Exhibit 4: Agricultural Water Measurement Regulation	

Glenn-Colusa Irrigation District

SBX7-7 Water Measurement Compliance Program

Purpose

In accordance with California Water Code §10106.48(b), Article 2, §597.1(a), GCID is proposing to implement a program to comply with specified requirements within the Agricultural Water Measurement Regulation. This SBX7-7 Water Measurement Compliance Program (Program), which will become a component of the District's Agricultural Water Management Plan, describes how GCID will comply with the SBX7-7 water measurement requirements and adopted regulations, attached hereto as "Exhibit 4." This Program will provide the following pursuant to §597.4 (e):

1. Documentation as required to demonstrate compliance with §597.3 (b), as outlined in section §597.3(b)(2), and §597.4(b)(2).
2. A description of best professional practices about, but not limited to, the (1) collection of water measurement data, (2) frequency of measurements, (3) method for determining irrigated acres, and (4) quality control and quality assurance procedures.
3. If a water measurement device measures flow rate, velocity or water elevation, and does not report the total volume of water delivered, the agricultural water supplier must document in its Agricultural Water Management Plan how it converted the measured value to volume. The protocols must follow best professional practices and include the following methods for determining volumetric deliveries:
 - a. For devices that measure flow-rate, documentation shall describe protocols used to measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$.
 - b. For devices that measure velocity only, the documentation shall describe protocols associated with the measurement of the cross-sectional area of flow and duration of water delivery, where volume is derived by the following formula: $\text{Volume} = \text{velocity} \times \text{cross-section flow area} \times \text{duration of delivery}$.
 - c. For devices that measure water elevation at the device (e.g. flow over a weir or differential elevation on either side of a device), the

documentation shall describe protocols associated with the measurement of elevation that was used to derive flow rate at the device. The documentation will also describe the method or formula used to derive volume from the measured elevation value(s).

4. If an existing measurement device is determined to be out of compliance with §597.3, and the agricultural water supplier is unable to bring it into compliance before submitting its Agricultural Water Management Plan, the agricultural water supplier shall provide in its plan, a schedule, budget and finance plan for taking corrective action in three years or less.

Program Components

To comply with the SBX7-7 water measurement requirements and adopted regulations, the Program will include the following critical components:

- Proposed physical measurement alternatives and criteria.
- Proposed measurement protocols, customer billing, and reporting.
- Proposition 218 compliance to address new infrastructure costs and new rate methodologies incorporating in-part volumetric pricing.

Proposed Physical Measurement Alternatives and Criteria

The Program will employ water measurement using a combination of lateral level (upstream) turnout measurement to multiple customers, and measurement to individual customer turnouts. In development of the Program, the District will develop a master plan overview of existing and proposed measurement facilities identifying the water delivery service area served by the lateral level (upstream) measurement turnouts and the service area served by individual turnouts. This master plan will also identify the measurement device at the lateral level (upstream) turnout measurement point (main canal metered laterals, main canal unmetered laterals, main canal lift pumps/pump ditches, pump recapture sites, and gravity recapture sites), or individual turnout measurement points (main canal and certain individual customer turnouts that serve individual fields). The information regarding the proposed metering methods and equipment necessary to comply with the volumetric pricing requirement, are further discussed in "Exhibit 3" which provides general, non-exclusive options for the types of devices that could be utilized to meet §597.3(a), §597.3(b)(1), and elements of §597.4 (e)(2).

A combination of lateral level (upstream) turnout measurement and individual turnout measurement is required because the options in §597.3(a) cannot be met, at the majority of locations, by installing a manufactured or on-site built

device at each downstream individual customer delivery point. This is due to small differentials in water levels from laterals to the fields, and large fluctuations in flow rate that result in poorly functioning devices. This determination shall be evaluated and certified by an engineer in accordance with §597.3(b)(2)(B).

GCID's water conveyance system presents a wide range of physical conditions that make planning for and complying with the SBX7-7 water measurement requirements challenging. In order to address these challenges, GCID will conduct a Pilot Project (See "Exhibit 1") by installing metering equipment at representative sites to identify workable metering solutions, infrastructure modification requirements, and refine costs. Site modification and construction requirements, and costing derived from the Pilot Project will provide important information to support funding requirements and the required Proposition 218 process. The Pilot Project will be funded from the current GCID budget.

It is anticipated that the Pilot Project and subsequent Water Measurement Compliance Program will employ a combination of metering devices best suited to these various physical conditions. For lateral level (upstream) turnout measurement, the District will use a combination of measurement devices, which may include propeller meters, acoustic doppler meters, portable acoustic doppler meters, and weirs with pressure transducers:

- A. Propeller meters with electronic flow rate and total quantity indicators will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1). The propeller meters measure velocity in pressurized pipes, which based on the cross-sectional area of the pipe is converted to an instantaneous flow rate. The totalizer on the device will report the total volume of water delivered by summing all of the previous measured instantaneous volumes to yield the total volume measured to date. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$).
- B. Acoustic doppler velocity meters with electronic flow rate indicator and totalizer will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1). The acoustic doppler meter averages velocity and cross-sectional area at the measurement site over a specified time interval, which yields an average flow rate for this specified time interval. The totalizer on the device will report the total volume of water delivered by taking this average flow over a period of time. (Best professional practices shall ensure that manufacturer documentation describes protocols used to

measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$.)

- C. Portable acoustic doppler meters will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.2(a)(b)(1). The portable acoustic doppler meter averages velocity and cross-sectional area at the measurement site over a specified time interval, which yields an average flow rate for this specified time interval. The average flow rate multiplied by the accumulated time duration at a constant maintained flow will yield the total volume of water delivered during the period of constant flow. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$).
- D. Weirs with pressure transducer measurement devices will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1). Weirs with pressure transducer measurement devices measure water elevation. This data is used in conjunction with industry standard equations and/or methodologies specific to the type of weir utilized with the pressure transducer elevation readings to determine flow. The flow shall be either programmed into a data logging device for direct report of volume, or the data will be processed in spreadsheets to obtain volume. (Best professional practices shall ensure that manufacturer documentation describes protocols used to measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$.) Weir measurement devices, including rectangular or v-notch weir measurement devices, will be certified by an engineer to meet the requirements of §597(a)(2)(B).

Similarly, for individual turnout measurement, the District will use a combination of measurement devices, which may include propeller meters, acoustic doppler meters, portable acoustic doppler meters, and weirs with pressure transducers:

- A. Propeller meters with electronic flow rate and total quantity indicators will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1).
- B. Acoustic doppler meters with electronic flow rate indicator and totalizer will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1).

- C. Portable acoustic doppler meters will be used on existing and future measurement sites consistent with the accuracy standards established in Regulation §597.2(a)(b)(1).
- D. Weir with pressure transducer measurement devices will be used on some existing and future measurement sites consistent with the accuracy standards established in Regulation §597.3(a)(b)(1). Rectangular or v-notch weir measurement devices will be certified to meet the water measurement requirements of §597.3(a)(2)(B); (b)(1).

"Exhibit 2" presents the projected timeline for implementation of this Program, factoring in the Pilot Project process, number of metering sites, monetary resources, limited annual construction periods and physical conditions, including weather, during GCID's 6-week winter maintenance period available for the installation of the metering equipment.

Proposed Measurement Protocols, Customer Billing, and Reporting

Currently, GCID has an active and robust measurement program throughout the distribution system including main diversion points, laterals, sublaterals, spill points, drain water recycling stations, etc. in order to effectuate good water management. Annually, the District completes a Water Measurement Report, which summarizes data on a monthly and yearly basis from all the water flow measurement points. This report is developed using a sophisticated and real-time Access database. The District has also made significant investments in Supervisory Control and Data Acquisition (SCADA), measurement reports, conjunctive use programs, conveyance improvements, and reuse facilities, all for the purpose of managing water supplies under a broad range of hydrology, delivery constraints, and ecosystem needs. This information is provided to the State Water Resources Control Board, Bureau of Reclamation, and Department of Water Resources.

A. Measurement Protocol

For this Program, the District will need to collect monthly measurement records, which will be used to develop billings to individual customers. Measurement records will be batched to the District's Water Information System to provide for a complete record of District deliveries, and then to the Water Accounting Program, which will be used to generate water user billings.

For lateral level (upstream) turnout and individual turnout measurement, the acreage and cropping pattern will be used to allocate and apportion flows to water users within a lateral or individual service area. Currently, the District generates an annual crop report that is included in the Water Measurement Report and also calculates the acreage of each crop within

each service area. This information is obtained from water users during the water application process and then is confirmed by District personnel during mid-year field inspections.

B. Customer Billing

Currently, the District utilizes a customer accounting program that bills water users based on a per-acre land based assessment, a standby charge, and volumetric consumption rate based on the planted crop applied water use and evapotranspiration rate. The rates are reviewed on an annual basis and may be increased at the discretion of the Board of Directors, and as approved by landowners pursuant to a Proposition 218 rate setting process.

With a new billing structure required to comply with SBX7-7 water measurement requirements, the District will need to migrate to a new Water Accounting Program that will enable information to be downloaded from the Water Information System and to allow for lateral level and individual turnout measurement, and apportionment processes. Additionally, the District currently bills in five installments but, since in-part volumetric pricing will be required, the billing structure and collection process of the volumetric component may need to change to a monthly billing cycle.

C. Reporting

As required in §531.10(a) of the California Water Code, the District will submit an annual report to the Department that summarizes aggregated farm-gate delivery data on a monthly basis using best professional practices.

Proposition 218 Compliance to Address New Infrastructure Costs and New Rate Methodologies Incorporating In-Part Volumetric Pricing

After the Pilot Project has been completed and the District has selected the type of equipment that will be necessary to comply with SBX7-7 water measurement requirements, the District will undertake a public outreach effort that will include a series of public landowner and water user meetings to educate stakeholders on the costs and the water rate increases that will be necessary to comply with the new law. Through a series of meetings with its water users, the District will ultimately settle on one preferred rate structure, and in accordance with the requirements of California's Proposition 218, an Engineer's Report will be prepared by a registered Civil Engineering Firm. After the Engineer's Report is completed, the District will hold a public meeting to review the Engineer's Report and proposed rate structure. This meeting will trigger the start of a 45-day time period that will allow all landowners to participate in a mail ballot election on the

proposed changes to the rate structure. At the end of the 45-day period, the District will hold a hearing to tally the mail ballot results and set the rates.

It is important to note that compliance with the SBX7-7 water measurement requirements will be based on the rate structure being approved by customers under Proposition 218 as required by Article XIIIID of the California Constitution. Under Proposition 218, the District is not able to increase water rates or assessments to fund the Program without the approval of its landowners.

EXHIBIT 1: SBX7-7 METERING ALTERNATIVES PILOT PROJECT
COST ESTIMATE FOR WATER YEAR 2013 TESTING

Delivery/Meter Location	Meter Model or System	Pipe Type and Diameter	Meter System Cost	SCADA System Cost and Integrator cost	Infrastructure Cost (includes installation)	Sub-total/Site District Labor & Equipment Not included
MC-58-L	Mace ADV M w/ Combo Sensor System	RCP 24"	\$5,118	\$4,400 +\$400	\$1,500	\$11,418
MC-52-L	SonTek- IQ Pipe	RCP 18"	\$9,925	\$4,400+\$400	\$500	\$15,225
MC-57-L	Mace ADV M w/ Insert Sensor	Smooth Steel 12"	\$4,396	\$4,400+\$400	\$1,000	\$10,196
Lat. 22-1	McCrometer M1700 Digital Propeller Elect. Meter	RCP 30"	\$2651	\$4,400+\$400	\$500	\$7,951
Lat. 26-2@ Co. Rd. 53 Bridge	SonTek-IQXP	6H"x10"Wx23'L Bridge Xing	\$8,500	\$4,400+\$400	\$1,000	\$14,300* *(\$7,150/pipe)
Lat . 35-1	SonTek-SL	5'Hx7"Wx30'L Bridge Xing	\$9,000	\$4,400+\$400	\$1,000	\$14,800* *(\$7,800/pipe)
MC 84-L	Mace AgriFlo XCI	24"RCP	\$5,200	\$4,000+\$400	\$1,000	\$10,600* *(\$5,300/pipe)
Lat. 29-2	Mace AgriFlo XCI	48"RCP	\$5,200	\$4,000+\$400	\$500	\$10,500
Lat. 30-1 Sta. 3+00	Long Throated Flume with Transducer	Open Channel 10ft. bottom width	\$18,000	\$4,000+\$400	\$500	\$23,300** **Flood/Lat. Channel
MC 95-L	"V-Notch" weir w/ transducer	12" RCP	\$2,600	\$4,400+\$400	\$1000	\$8,400
MC-M. 28.09R Lift Pump	McCrometer MO312 Digital Saddle Meter	12'Smooth Steel	\$1989	\$4,400+\$400	\$500	\$7,289
MC 100-L	Mace ADV M w/ Insert Sensor	36" CMP	\$4,396	\$4,400+\$400	\$1,000	\$10,196
Lat. 32-2	SonTek IQ	Open Channel	\$7,800	\$4,400+\$400	\$3,500 (liner)	\$16,100* *(\$8,200/pipe)
MC-M.P. 44.93	SonTek IQPipe	Stone Corral 42" Canal Spill	\$9,925	\$1,000+\$400	\$500	\$11,825
Remote Tracker ADV M w/Bluetooth and WWIN signal to Office Computer	SonTek ADV wireless velocity sensor/Panasonic CF-19 Laptop	All Types of Pipes fitted with weir box	\$30,000 for a System that can measure 5-10 sites	\$5,000 cost for integrator incorporating program downloads to GCID WIS	5 Weir boxes and Probe brackets @ \$1,100/ea. = \$5,500	\$40,500/five sites equals \$8,100 per site
Total for Pilot Project Testing Six Measurement Systems on Full, Partially Full, Open Channel and Lift Pump Scenarios for the 2013 Irrigation Season.....						\$212,600

EXHIBIT 2: IMPLEMENTATION TIMELINE

Date	Action
December 2012	Complete SBX7-7 infrastructure planning and cost estimates
December 31, 2012	Complete SBX7-7 Water Measurement Compliance Program in preparation for submission to DWR pending USBR approval of Regional Water Management Plan
February 14, 2013	GCID Board of Directors review and consideration of the Regional Water Management Plan, and SBX7-7 Water Measurement Compliance Program
Phase I - Pilot Project	
March to May 2013	Conduct pilot program by installing various metering options at representative sites to assess construction requirements, confirm meter accuracy, and refine costs
May to October 2013	Operate Pilot Project metering site equipment to evaluate overall operation and accuracy
Phase II - Finalize Metering Program	
November 2013 to January 2014	Information from the Pilot Project will be used to: <ul style="list-style-type: none"> - Identify actual metering solutions by site - Prepare a detailed budget and schedule for implementation
Phase III - Public Outreach and Water Rate Structure	
February 2014	Hold landowner/public meetings on Project cost
March to September 2014	Develop assessment and water rate structure alternatives and continue to gather feedback from GCID water users
Phase IV – Proposition 218 Process	
October 2014 to January 2015	Complete Engineering Report in accordance with Proposition 218 assessment and water rate requirements
February 2015	Hold landowner/public meetings on results of Engineering Report and proposed rate structure
June 2015	Begin 45-day mandatory Proposition 218 notice period
August 2015	Hold final Proposition 218 hearing, and set rates

Phase V – Installation of Metering Infrastructure	
October 2015	<p>Begin full-scale installation of metering infrastructure pending outcome of the Proposition 218 process</p> <p>It is anticipated that a maximum of 30 metering sites can be installed per year due to critical issues that impact design, construction, and installation of metering equipment, including:</p> <ul style="list-style-type: none"> - Special conditions created by the presence of aquatic weed infestations - Year-round water service confines major construction activities to a 6-week period during January and February, and other limited periods when dry conditions allow - Weather conditions can limit construction activities during the winter months - Installation of metering infrastructure is dependent upon funding and successful completion of the Proposition 218 process

Flow Condition	Measurement Device	Type of Device	Manufacturer Accuracy for New Device	SBX7-7 Accuracy Criteria	Volumetric Conversion Protocol per §597.4 (e)(3)	Frequency of Measurements per §597.4 (e)(2)(2)	Installation Criteria per Best Professional Practices	Collection of Water Measurement Data per §597.4 (e)(2)(1)
Open Channel	Measurement Specialties 730S	Pressure transducer with stilling well	▪ ±0.1 Full Scale Output by Best-Fit Straight Line	<u>As Applicable:</u> New: Requires §597.3 (a)(2); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Stage-Weir discharge relationship	5-15 minutes unless Best Professional Practices determine otherwise	Install in a location with minimal turbulence and appropriate pressure measuring range	Real-time remote acquisition and/or monthly physical connection with device storage for download
	Water Pilot FMX 167	Pressure transducer with stilling well	▪ Maximum measured error: ±0.2% of upper range value	<u>As Applicable:</u> New: Requires §597.3 (a)(2); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Stage-Weir discharge relationship	5-15 minutes unless Best Professional Practices determine otherwise	Install in a location with minimal turbulence and appropriate pressure measuring range	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek IQ (Standard or Plus)	Acoustic doppler current meter	▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Install at least ten channel widths upstream and downstream of any flow disturbances (i.e. gates, curves, abrupt changes in elevation)	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek SL 1500	Acoustic doppler current meter	▪ ± 1% of measured velocity, ± 0.015 ft/s ▪ ±0.3cm (0.01 ft) of measured depth ±0.1%	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Straight and uniform canal stretch with minimal turbulence	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek SW	Acoustic doppler current meter	▪ ±1% of measured velocity, ± 0.015 ft/s ▪ ±0.1% of measured depth, ±0.3 cm (0.01 ft)	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Straight and uniform canal stretch with minimal turbulence	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek IQ Pipe	Acoustic doppler current meter	▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2) (A); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	10 pipe diameters in either direction from an obstruction or flow diversion	Real-time remote acquisition and/or monthly physical connection with device storage for download

Flow Condition	Measurement Device	Type of Device	Manufacturer Accuracy for New Device	SBX7-7 Accuracy Criteria	Volumetric Conversion Protocol per §597.4 (e)(3)	Frequency of Measurements per §597.4 (e)(2)(2)	Installation Criteria per Best Professional Practices	Collection of Water Measurement Data per §597.4 (e)(2)(1)
Full Pipe	McCrometer <i>Mc Propeller M1700</i>	Propeller Open Flow meter	▪ ±2% of measured velocity with repeatability of ±0.25%	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning: 10 pipe diameters upstream	Real-time remote acquisition and/or monthly physical connection with device storage for download
	McCrometer <i>Bolt-On Saddle Flowmeter MO300 or M1400</i>	Propeller meter	▪ ±2% of measured velocity with repeatability of ±0.25%	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning: 10 pipe diameters upstream and two diameters downstream of the meter	Real-time remote acquisition and/or monthly physical connection with device storage for download
	Mace <i>Doppler Velocity Insert</i>	Doppler ultrasonic velocity sensor	▪ ±1% of measured velocity, up to 10 ft/s	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1) Existing: Requires §597.3 (a)(1); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning is valve dependent: 6-15 pipe diameters upstream and 2-6 diameters downstream	Real-time remote acquisition and/or monthly physical connection with device storage for download
	SonTek <i>IQ Pipe</i>	Acoustic doppler current meter	▪ ±0.1% of full scale pressure ▪ ±1% of measured velocity, ±0.5 cm/s (0.2 in/s) ▪ 0.1% of measured depth or ±0.003 m (0.01 ft) whichever is greater	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	10 pipe diameters in either direction from an obstruction or flow diversion	Real-time remote acquisition and/or monthly physical connection with device storage for download
	H2o Tech RemoteTracker	Acoustic doppler velocimeter	▪ ±4.6%	<u>As Applicable:</u> New: Satisfies §597.3 (a)(2)(A); (b)(1)	Device reports total volume of water delivered using: $V = \sum_{i=1}^n v_i A_i T$	5-15 minutes unless Best Professional Practices determine otherwise	Positioning: Weir box at turnout to ensure full pipe flow with bracket to position sensor at center of pipe	Real-time remote acquisition and/or monthly bluetooth connection with device storage for download

Please Note:

The Volumetric conversion protocol variables are defined below.

$$V = \sum_{i=0}^n v_i A_i T$$

V (Volume, ft³)

Σ (summation sign)

n (final reported measurement for the year)

$i=1$ (first measurement)

v_i (velocity, ft/s)

A_i (cross sectional area, ft²)

T (sample time duration of measurement)

Essentially, this equation states that the volume of water measured over a sample time will be totaled to all previous measured volumes to yield the total volume measured thus far at that time in the year.

Exhibit 4

State of California
The Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
Division of Statewide Integrated Water Management
Water Use and Efficiency Branch

Agricultural Water Measurement

A regulation included under the authority of
Section 10608.48(i) (1) and(2) of the California Water Code



July 11, 2012

Edmund G. Brown Jr.
Governor
State of California

John Laird
Secretary for Natural Resources
The Natural Resources Agency

Mark W. Cowin
Director
Department of Water Resources

**State of California
Office of Administrative Law**

In re:
Department of Water Resources

**NOTICE OF APPROVAL OF REGULATORY
ACTION**

Regulatory Action:

Government Code Section 11349.3

Title 23, California Code of Regulations

OAL File No. 2012-0531-01 SR

Adopt sections: 597, 597.1, 597.2, 597.3,
597.4

Amend sections:

Repeal sections:

The Department of Water Resources proposed this action to adopt five sections and create a new article in title 23 of the California Code of Regulations for agricultural water measurement. The purpose of the regulatory action is to provide a range of options that agricultural water suppliers may use or implement to comply with the water measurement requirements in Water Code 10608.48(b)(1). These regulations implement amendments to the Water Code made in S.B. 7 (Stats. 2009, 7th Ex. Sess., ch. 4).

OAL approves this regulatory action pursuant to section 11349.3 of the Government Code. This regulatory action becomes effective on 7/11/2012.

Date: 7/11/2012



Richard L. Smith
Senior Counsel

For: DEBRA M. CORNEZ
Director

Original: Mark Cowin
Copy: Kent Frame

California Code of Regulations
Title 23. Waters
Division 2. Department of Water Resources
Chapter 5.1. Water Conservation Act of 2009
Article 2. Agricultural Water Measurement

§597. Agricultural Water Measurement

Under the authority included under California Water Code §10608.48(i)(1), the Department of Water Resources (Department) is required to adopt regulations that provide for a range of options that agricultural water suppliers may use or implement to comply with the measurement requirements in paragraph (1) of subdivision (b) of §10608.48.

For reference, §10608.48(b) of the California Water Code states that:

Agricultural water suppliers shall implement all of the following critical efficient management practices:

- (1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).*
- (2) Adopt a pricing structure for water customers based at least in part on quantity delivered.*

For further reference, §531.10(a) of the California Water Code requires that:

- (a) An agricultural water supplier shall submit an annual report to the department that summarizes aggregated farm-gate delivery data, on a monthly or bi-monthly basis, using best professional practices.*

Notes:

- (1) Paragraphs (1) and (2) of §10608.48(b) specify agricultural water suppliers' reporting of aggregated farm-gate water delivery and adopting a volumetric water pricing structure as the purposes of water measurement. However, this article only addresses developing a range of options for water measurement.*
- (2) Agricultural water suppliers reporting agricultural water deliveries measured under this article shall use the "Agricultural Aggregated Farm – Gate Delivery Reporting Format for Article 2" (Rev. 6-20-12), developed for this article and hereby incorporated by reference.*

- (3) The Department shall report on the availability of new commercially available water measurement technologies and impediments to implementation of this article when reporting to the Legislature the status of adopted Agricultural Water Management Plans in plan submittal years 2012, 2015 and every five years thereafter as required by California Water Code §10845. The Department shall also report the findings to the California Water Commission.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 (b), 10608.48 (i), 10608.52 (b) and 10845 Water Code.

§597.1. Applicability

- (a) An agricultural water supplier providing water to 25,000 irrigated acres or more, excluding acres that receive only recycled water, is subject to this article.
- (b) A wholesale agricultural water supplier providing water to another agricultural water supplier (the receiving water supplier) for ultimate resale to customers is subject to this article at the location at which control of the water is transferred to the receiving water supplier. However, the wholesale agricultural water supplier is not required to measure the receiving agricultural water supplier's deliveries to its customers.
- (c) A water supplier providing water to wildlife refuges or habitat lands where (1) the refuges or habitat lands are under a contractual relationship with the water supplier, and (2) the water supplier meets the irrigated acreage criteria of Water Code §10608.12(a), is subject to this article.
- (d) An agricultural water supplier providing water to less than 10,000 irrigated acres, excluding acres that receive only recycled water, is not subject to this article.
- (e) An agricultural water supplier providing water to 10,000 or more irrigated acres but less than 25,000 irrigated acres, excluding acres that receive only recycled water, is not subject to this article unless sufficient funding is provided specifically for that purpose, as stated under Water Code §10853.
- (f) A canal authority or other entity that conveys or delivers water through facilities owned by a federal agency is not subject to this article.
- (g) Pursuant to Water Code §10608.8(d), an agricultural water supplier "that is a party to the Quantification Settlement Agreement, as defined in subdivision (a) of Section 1 of Chapter 617 of the Statutes of 2002, during the period within which the Quantification Settlement Agreement remains in effect," is not subject to this article.
- (h) Pursuant to Water Code §10608.12(a), the Department is not subject to this article.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 10608.12 (a), 10608.48 (d), 10608.48 (f), 10828, and 10853 Water Code.

§597.2. Definitions

(a) For purposes of this article, the terms used are defined in this section.

- (1) "Accuracy" means the measured volume relative to the actual volume, expressed as a percent. The percent shall be calculated as $100 \times (\text{measured value} - \text{actual value}) / \text{actual value}$, where "measured value" is the value indicated by the device or determined through calculations using a measured value by the device, such as flow rate, combined with a duration of flow, and "actual value" is the value as determined through laboratory, design or field testing protocols using best professional practices.
- (2) "Agricultural water supplier," as defined in Water Code §10608.12(a), means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding acres that receive only recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the Department.
- (3) "Approved by an engineer" means a California-registered Professional Engineer has reviewed, signed and stamped the plans, design, testing, inspection, and/or documentation report for a measurement device as described in this article.
- (4) "Best professional practices" means practices attaining to and maintaining accuracy of measurement and reporting devices and methods described in this article, such as operation and maintenance procedures and practices recommended by measurement device manufacturers, designers, and industry professionals.
- (5) "Customer" means the purchaser of water from an agricultural water supplier who has a contractual arrangement with the agricultural water supplier for the service of conveying water to the customer delivery point.
- (6) "Delivery point" means the location at which the agricultural water supplier transfers control of delivered water to a customer or group of customers. In most instances, the transfer of control occurs at the farm-gate, which is therefore, a delivery point.
- (7) "Existing measurement device," means a measurement device that was installed in the field prior to the effective date of this article.
- (8) "Farm-gate," as defined in Water Code §531(f), means the point at which water is delivered from the agricultural water supplier's distribution system to each of its customers.

- (9) "Irrigated acres," for purposes of applicability of this article, is calculated as the average of the previous five-year acreage within the agricultural water supplier's service area that has received irrigation water from the agricultural water supplier.
- (10) "Manufactured device" means a device that is manufactured by a commercial enterprise, often under exclusive legal rights of the manufacturer, for direct off-the-shelf purchase and installation. Such devices are capable of directly measuring flow rate, velocity, or accumulating the volume of water delivered, without the need for additional components that are built on-site or in-house.
- (11) "Measurement device" means a device by which an agricultural water supplier determines the numeric value of flow rate, velocity or volume of the water passing a designated delivery point. A measurement device may be a manufactured device, on-site built device or in-house built device.
- (12) "New or replacement measurement device" means a measurement device installed after the effective date of this article.
- (13) "Recycled water" is defined in subdivision (n) of §13050 of the Water Code as water that, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur, and is therefore considered a valuable resource.
- (14) "Type of device" means a measurement device that is manufactured or built to perform similar functions. For example, rectangular, v-notch, and broad crested weirs are one type of device. Similarly, all submerged orifice gates are considered one type of device.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 10608.12 (a), 10608.12 (m), 10608.48, and 10813 Water Code.

§597.3 Range of Options for Agricultural Water Measurement

An agricultural water supplier subject to this article shall measure surface water and groundwater that it delivers to its customers pursuant to the accuracy standards in this section. The supplier may choose any applicable single measurement option or combination of options listed in paragraphs (a) or (b) of this section. Measurement device accuracy and operation shall be certified, tested, inspected and/or analyzed as described in §597.4 of this article.

(a) Measurement Options at the Delivery Point or Farm-gate of a Single Customer

An agricultural water supplier shall measure water delivered at the delivery point or farm-gate of a single customer using one of the following measurement options. The stated numerical accuracy for each measurement option is for the volume delivered. If a device measures a value other than volume, for example, flow rate,

velocity or water elevation, the accuracy certification must incorporate the measurements or calculations required to convert the measured value to volume as described in §597.4(e).

- (1) An existing measurement device shall be certified to be accurate to within $\pm 12\%$ by volume.

and,

- (2) A new or replacement measurement device shall be certified to be accurate to within:

(A) $\pm 5\%$ by volume in the laboratory if using a laboratory certification;

(B) $\pm 10\%$ by volume in the field if using a non-laboratory certification.

(b) Measurement Options at a Location Upstream of the Delivery Points or Farm-gates of Multiple Customers

- (1) An agricultural water supplier may measure water delivered at a location upstream of the delivery points or farm-gates of multiple customers using one of the measurement options described in §597.3(a) if the downstream individual customer's delivery points meet either of the following conditions:

(A) The agricultural water supplier does not have legal access to the delivery points of individual customers or group of customers needed to install, measure, maintain, operate, and monitor a measurement device.

Or,

(B) An engineer determines that, due to small differentials in water level or large fluctuations in flow rate or velocity that occur during the delivery season at a single farm-gate, accuracy standards of measurement options in §597.3(a) cannot be met by installing a measurement device or devices (manufactured or on-site built or in-house built devices with or without additional components such as gauging rod, water level control structure at the farm-gate, etc.). If conditions change such that the accuracy standards of measurement options in §597.3(a) at the farm-gate can be met, an agricultural water supplier shall include in its Agricultural Water Management Plan, a schedule, budget and finance plan to demonstrate progress to measure water at the farm-gate in compliance with §597.3(a) of this article.

- (2) An agricultural water supplier choosing an option under paragraph (b)(1) of this section shall provide the following current documentation in its Agricultural Water Management Plan(s) submitted pursuant to Water Code §10826:

- (A) When applicable, to demonstrate lack of legal access at delivery points of individual customers or group of customers downstream of the point of measurement, the agricultural water supplier's legal counsel shall certify to the Department that it does not have legal access to measure water at customers delivery points and that it has sought and been denied access from its customers to measure water at those points.
 - (B) When applicable, the agricultural water supplier shall document the water measurement device unavailability and that the water level or flow conditions described in §597.3(b)(1)(B) exist at individual customer's delivery points downstream of the point of measurement as approved by an engineer.
 - (C) The agricultural water supplier shall document all of the following criteria about the methodology it uses to apportion the volume of water delivered to the individual downstream customers:
 - (i) How it accounts for differences in water use among the individual customers based on but not limited to the duration of water delivery to the individual customers, annual customer water use patterns, irrigated acreage, crops planted, and on-farm irrigation system,

and;

 - (ii) That it is sufficient for establishing a pricing structure based at least in part on the volume delivered,
- and;
- (iii) That it was approved by the agricultural water supplier's governing board or body.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 (i) (1), and 10826 Water Code.

§597.4 Accuracy Certification, Records Retention, Device Performance, and Reporting

(a) Initial Certification of Device Accuracy

The accuracy of an existing, new or replacement measurement device or type of device, as required in §597.3, shall be initially certified and documented as follows:

- (1) For existing measurement devices, the device accuracy required in section 597.3(a) shall be initially certified and documented by either:
 - (A) Field-testing that is completed on a random and statistically representative sample of the existing measurement devices as described in §597.4(b)(1) and §597.4(b)(2). Field-testing shall be performed by individuals trained in the use of field-testing equipment, and documented in a report approved by an engineer.

Or,

(B) Field-inspections and analysis completed for every existing measurement device as described in §597.4(b)(3). Field-inspections and analysis shall be performed by trained individuals in the use of field inspection and analysis, and documented in a report approved by an engineer.

(2) For new or replacement measurement devices, the device accuracy required in sections 597.3 (a)(2) shall be initially certified and documented by either:

(A) Laboratory Certification prior to installation of a measurement device as documented by the manufacturer or an entity, institution or individual that tested the device following industry-established protocols such as the National Institute for Standards and Testing (NIST) traceability standards. Documentation shall include the manufacturer's literature or the results of laboratory testing of an individual device or type of device.

Or,

(B) Non-Laboratory Certification after the installation of a measurement device in the field, as documented by either:

(i) An affidavit approved by an engineer submitted to the agricultural water supplier of either (1) the design and installation of an individual device at a specified location, or (2) the standardized design and installation for a group of measurement devices for each type of device installed at specified locations.

Or,

(ii) A report submitted to the agricultural water supplier and approved by an engineer documenting the field-testing performed on the installed measurement device or type of device, by individuals trained in the use of field testing equipment.

(b) Protocols for Field-Testing and Field-Inspection and Analysis of Existing Devices

(1) Field-testing shall be performed for a sample of existing measurement devices according to manufacturer's recommendations or design specifications and following best professional practices. It is recommended that the sample size be no less than 10% of existing devices, with a minimum of 5, and not to exceed 100 individual devices for any particular device type. Alternatively, the supplier may develop its own sampling plan using an accepted statistical methodology.

(2) If during the field-testing of existing measurement devices, more than one quarter of the samples for any particular device type do not meet the criteria pursuant to §597.3(a), the agricultural water supplier shall provide in its Agricultural Water

Management Plan, a plan to test an additional 10% of its existing devices, with a minimum of 5, but not to exceed an additional 100 individual devices for the particular device type. This second round of field-testing and corrective actions shall be completed within three years of the initial field-testing.

- (3) Field-inspections and analysis protocols shall be performed and the results shall be approved by an engineer for every existing measurement device to demonstrate that the design and installation standards used for the installation of existing measurement devices meet the accuracy standards of §597.3(a) and operation and maintenance protocols meet best professional practices.

(c) Records Retention

Records documenting compliance with the requirements in §597.3 and §597.4 shall be maintained by the agricultural water supplier for ten years or two Agricultural Water Management Plan cycles.

(d) Performance Requirements

- (1) All measurement devices shall be correctly installed, maintained, operated, inspected, and monitored as described by the manufacturer, the laboratory or the registered Professional Engineer that has signed and stamped certification of the device, and pursuant to best professional practices.
- (2) If an installed measurement device no longer meets the accuracy requirements of §597.3(a) based on either field-testing or field-inspections and analysis as defined in sections 597.4 (a) and (b) for either the initial accuracy certification or during operations and maintenance, then the agricultural water supplier shall take appropriate corrective action, including but not limited to, repair or replacement to achieve the requirements of this article.

(e) Reporting in Agricultural Water Management Plans

Agricultural water suppliers shall report the following information in their Agricultural Water Management Plan(s):

- (1) Documentation as required to demonstrate compliance with §597.3 (b), as outlined in section §597.3(b)(2), and §597.4(b)(2).
- (2) A description of best professional practices about, but not limited to, the (1) collection of water measurement data, (2) frequency of measurements, (3) method for determining irrigated acres, and (4) quality control and quality assurance procedures.
- (3) If a water measurement device measures flow rate, velocity or water elevation, and does not report the total volume of water delivered, the agricultural water supplier must document in its Agricultural Water Management Plan how it converted the

measured value to volume. The protocols must follow best professional practices and include the following methods for determining volumetric deliveries:

- (A) For devices that measure flow-rate, documentation shall describe protocols used to measure the duration of water delivery where volume is derived by the following formula: $\text{Volume} = \text{flow rate} \times \text{duration of delivery}$.
- (B) For devices that measure velocity only, the documentation shall describe protocols associated with the measurement of the cross-sectional area of flow and duration of water delivery, where volume is derived by the following formula: $\text{Volume} = \text{velocity} \times \text{cross-section flow area} \times \text{duration of delivery}$.
- (C) For devices that measure water elevation at the device (e.g. flow over a weir or differential elevation on either side of a device), the documentation shall describe protocols associated with the measurement of elevation that was used to derive flow rate at the device. The documentation will also describe the method or formula used to derive volume from the measured elevation value(s).
- (4) If an existing water measurement device is determined to be out of compliance with §597.3, and the agricultural water supplier is unable to bring it into compliance before submitting its Agricultural Water Management Plan in December 2012, the agricultural water supplier shall provide in its 2012 plan, a schedule, budget and finance plan for taking corrective action in three years or less.

Note: Authority cited: Section 10608.48, Water Code. Reference: Sections 531.10, 10608.48 (i) (1), and 10826 Water Code.

Agricultural Aggregated Farm-Gate¹ Delivery Reporting Format for Article 2

*Due annually beginning no later than July 31, 2013 from agricultural water suppliers subject to
Title 23, Division 2, Chapter 5.1, Article 2 of the CCR - Agricultural Water Measurement*

1. Water Supplier Information

Name:

Address:

Phone
Number:
Fax:

Total Number of Farm-Gates:

Number of Measured Farm-Gates:

Service Area Acreage:

2. Contact information

Name:

Title:

Address:

Phone
Number:

Fax:

E-mail:

Submittal date:

3. Aggregated Farm-Gate Delivery Data²: (provide monthly or bimonthly data, acre-feet)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Monthly Deliveries													
	Jul-Aug		Sep-Oct		Nov-Dec		Jan-Feb		Mar-Apr		May-Jun		Total
Bimonthly Deliveries													

4. Explanations, Comments and Best Professional Practices³:

Note: An agricultural water supplier's total water use may be different from Aggregated Farm-Gate deliveries because measurement at these points may not account for other practices (such as groundwater recharge/conjunctive use, water transfers, wheeling to other agencies, urban use, etc).

1. "Farm-gate" means the point at which water is delivered from the agricultural water supplier's distribution system to each of its individual customers as specified in the Agricultural Water Measurement Regulation (Title 23, Division 2, Chapter 5.1, Article 2 of the CCR).

2. "Aggregated farm-gate delivery data" means information reflecting the total volume of water an agricultural water supplier provides to its customers and is calculated by totaling its deliveries to customers.

3. "Best Professional Practices" is defined in Title 23, Division 2, Chapter 5.1, Article 2 of the CCR, Section 597.2.